SANYO

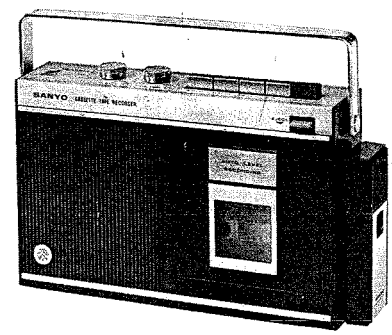
All fasteners subject to metric dimension of International Organization for Standardization.

Portable Cassette Recorder

MODEL MR-410

SERVICE MANUAL

SANYO ELECTRIC CO., LTD.
INTERNATIONAL DIVISION : SANYO ELECTRIC TRADING CO., LTD.
OSAKA, JAPAN



SPECIFICATIONS

Recording system	AC bias, double track	Frequency response	50 to 10,000 Hz
Erasing system	DC erase	Transistors	2SB303 × 1 2SB187 × 1
Tape speed	1-7/8 ips. (4.8 cm/sec.)		2SB186 × 1 2SB405 × 2
Recording (playback) time	1 hour (C-60)		2SB185 × 1
Rewind and fast forward time	1′ 45″ (C-60)	Diodes	1S188 × 1 1S1849 × 2
Output power	1.5W max.	Thermistor	SDT-06 × 1
Wow and flutter	0.3% RMS	Speaker	4″ (10 cm) P. D. S. 8Ω
Signal to noise ratio	40 dB	Power source	AC; 120/200/240 V, 50/60Hz multivoltage
Terminals	MIC. 10KΩ		DC; 6V, "C"-size (UM-2) batt. × 4
	AUX IN 270KΩ	Dimensions	6-7/16″(W) × 2-13/16″(L) × 6-3/16″(H)
	EXT SP 8Ω	Weight	4.8 lbs.
		Accessories	Microphone, audition cassette, AC cord

DISASSEMBLEY INSTRUCTION

To remove the amplifier and mechanism from the cabinet:

1. Pull out the Tone and Volume control knobs.
2. Place the recorder front side down and remove the screw from the center of the cabinet back.
3. Depressing the cabinet bottom with both thumbs, open the back cabinet. See Fig. 1 below.

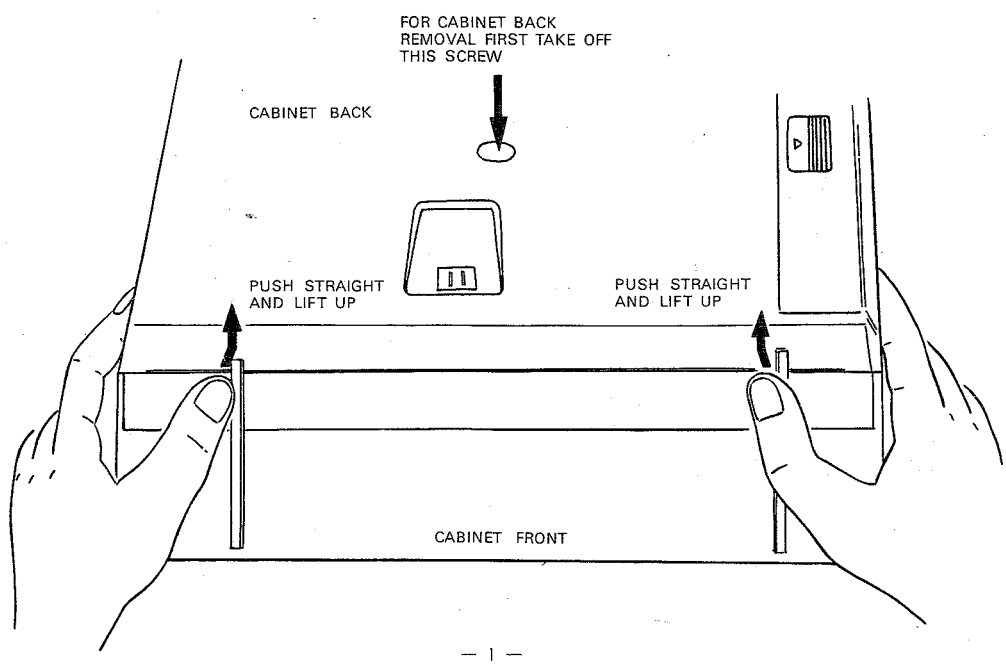


Fig 1.

MECHANICAL ADJUSTMENT

To measure the torque of the tape recorder, a torque gauge (Fig. 2) and a tension gauge are neccessary. To use a tension gauge, make a hole in the side of the Cassette as shown in Fig. 3. Be careful that the tape does not rub against the edge of the Cassette; this will make correct measurement impossible.

1. Take-up torque (measure with torque gauge)

Play	40 - 60 gr/cm
Fast forward	60 - 120 gr/cm
Rewind	60 - 120 gr/cm

2. Back tension (measure with tension gauge)

Play	2 - 15 gr/cm
Fast forward	2 - 15 gr/cm
Rewind	2 - 15 gr/cm

3. Tape tension

As shown in Fig. 4, cut off a length of tape. Tie one end to a thread connected to the tension gauge, and leave the other end hanging loose. Place the recorder in PLAY mode and hold the tension gauge steady (do not move it to the left or right).

When the tape stops, read the tension gauge. If this reading falls within the range of 50 - 200 gr., no adjustment is needed. If it does not fall within this range, adjust the pinch roller pressure.

This is done by changing the hole position of the coil spring (R-158155a). (Fig. 5) Clean the pinch roller (with alcohol only) so that the tape will not slip.

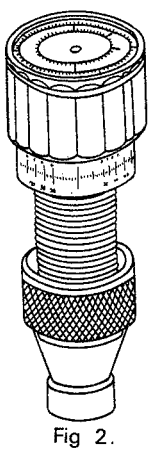


Fig 2.

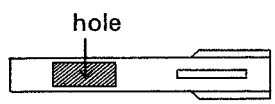


Fig 3.

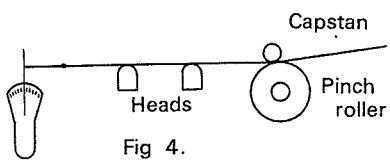


Fig 4.

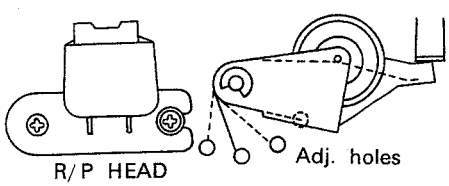


Fig 5.

4. Button pressure

Push the edge of the button as shown in Fig. 6. When the pressure required to lock each button falls within the range shown below, no adjustment is neccessary:

Stop→Play	800 ~ 1800 gr
Play→Stop	550 ~ 1000 gr
Stop→Forward	800 ~ 1800 gr
Stop→Rewind	800 ~ 1800 gr
Rewind→Stop	550 ~ 1000 gr
Stop→Record	400 ~ 850 gr
Record→Stop	250 ~ 1000 gr

If the pressure does not correspond to the above figures, adjust the strength of the coil springs (28); also adjust the force of the coil spring (22) connected to the slide (21).

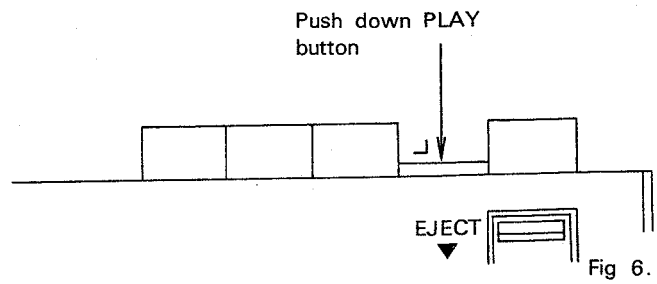


Fig 6.

5. Record/Play head azimuth adjustment

Maximum output and frequency response can be obtained only when the record/playback head is correctly aligned for Azimuth. Azimuth alignment refers to the positioning of the head in respect to the tape which passes across it during recording and playback. Since the head adjustment screw is set and sealed at the factory, adjustment should not be required unless the screw has been accidently put out of adjustment in some manner.

If a record/playback head becomes defective, it will be neccessary to align the new head for correct azimuth after installation. To do so, proceed as follows:

1. Thread a pre-recorded test tape (cassette type) (7,000 Hz standard frequency tape) onto the recorder.
2. Connect an AC voltmeter across the speaker voice coil terminals. To make this connection without removing the recorder from the cabinet, connect an external speaker or a dummy load resistor (same impedance as that of the speaker voice coil) to the MONIT EXT. SP. terminal.
   NOTE: Set the voltmeter on the 1.5 VAC scale.
3. Depress the PLAY button and turn the tone control clockwise until a reading is obtained on the AC voltmeter.
4. Rotate the head adjustment screws clockwise or counter-clockwise, and continue this procedure until maximum output is obtained as indicated by the AC voltmeter.

6. Head demagnetization

Magnetization of the heads may result when the continuity of the head is measured with an ohmmeter. If it is neccessary to measure head continuity, the head should be demagnetized after the continuity check.

Head magnetization is evidenced by a high residual noise (a hissing and low popping sound) when a virgin or completely erased tape is played at a high volume level.

The magnetization may be neutralized by use of a standard demagnetization tool. The tip of the tool should not be used through the pad but must be thin enough to fit between the pressure pad and the record/play head. A piece of cellulose tape should be placed over the end of the tool to prevent metal-to-metal contact between the tool and the head. After demagnetization is completed, slowly remove the tool from the vicinity of the head BEFORE the current is turned off.

ELECTRICAL ADJUSTMENT

1. Bias Oscillator Frequency
As shown in Fig. 7, connect a 10 ohm resistor in series with the ground lead wire of the Record/Playback head. Connect the vertical input of the oscilloscope across the resistor; connect the horizontal input of the oscilloscope to the output terminal of an Audio Frequency Oscillator (AF Oscillator).
With the switch set to RECORD mode and connected as above, a lissajous figure will appear on the oscilloscope. Standard frequency is 40 KHz ± 5 KHz. If the frequency is not within the above range, change the oscillator coil or C22 (680 pF).

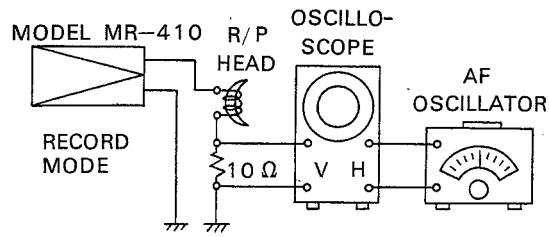
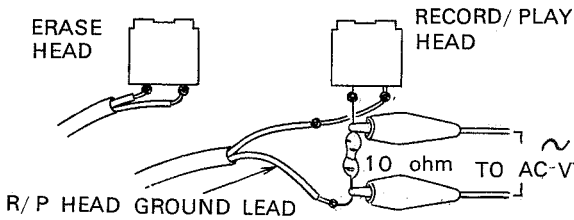


Fig 7.

2. Head Bias Current
Proper bias is necessary for optimum recording. Adjust the bias oscillator frequency as described above. Bias current during recording is measured at both ends of a 10 ohm resistor inserted between the R/P head and ground (See Fig. 8 below).
Before adjustment of VR-3, Bias-trap coil (20mH) should be adjusted. Adjust Bias-trap Coil with a plastic screwdriver or equivalent through the adj. hole on the printed circuit board, so that the voltage across 10 ohm resistor attains maximum value. Then, adjust VR-3 so that the voltage across 10 ohm resistor will be 0.35 mV to 0.40 mV on the AC VTVM.



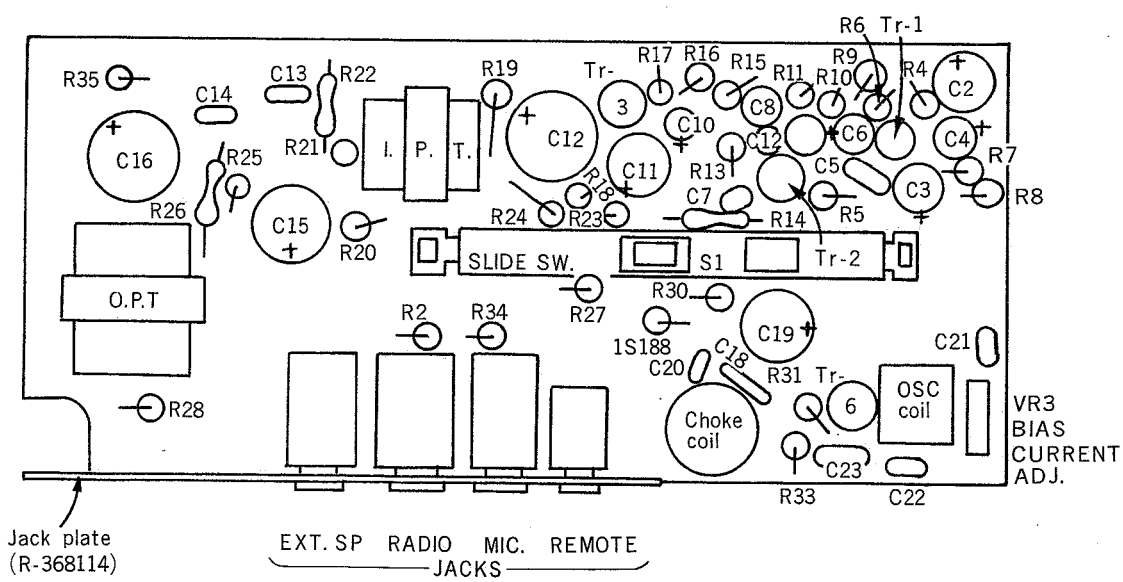
0,35 - 0,40 mV.

Fig 8.

VOLTAGE TABLE

MEASUREMENT		POINT	PLAYBACK	RECORD
Tr-1	2SB303	B	−0.50	−1.10
		E	−1.40	−1.50
		C	−2.90	−2.40
Tr-2	2SB186	B	−0.98	−0.80
		E	−0.90	−0.80
		C	−2.20	−2.60
Tr-3	2SB187	B	−2.00	−1.90
		E	−1.80	−1.70
		C	−4.40	−4.10
Tr-4 Tr-5	2SB405	B	−0.30	−0.30
		E	−0.10	−0.10
		C	−6.00	−6.00
Tr-6	2SB185	B	—	+0.40
		E	—	−0.35
		C	—	−5.40
POINT "A"			−4.70	−4.40
POINT "B"			−5.00	−4.70
POINT "C"			−5.80	−5.40

PARTS LOCATION



PARTS LIST

Parts No.	Description	Q'ty
PACKING		
As packaging parts depend upon the destination, your order must contain its destination mark (A, B, C or D) stamped on a individual carton of the recorder.		
* "B" or "D" marked recorder, order with following part nos.		
R-498822	Individual carton	1
R-498931	Carton filler	1
R-418225a	Styrol filler, Left side of set	1
R-418226	Styrol filler, Right side of set	1
R-478553	Instruction booklet	1
R-478391	Caution tag, power supply	1
R-368145	Vinyl case, power cord	1
	Poly-bag, 350 × 400, set	1
	Poly-bag, 100 × 200, microphone	1
	Poly-bag, 70 × 170, AC power cord	1
	Poly-bag, 140 × 240, set	1
	Poly-bag, 180 × 250, Inst. booklet	1
	Poly-bag, 80 × 120, Adaptor (ONLY "D")	1
* "A" or "C" marked recorder, order with following part nos.		
R-498853	Individual carton	1
R-498932	Carton filler, set and mic.	1
R-498933	Carton filler, bottom of set	1
R-418225a	Styrol filler, Left side of set	1
R-418226	Styrol filler, Right side of set	1
R-478553	Instruction booklet	1
R-478391	Caution tag, power supply	1
R-36195	Vinyl case, power cord	1
	Poly-bag, 350 × 400, set	1
	Poly-bag, 100 × 200, microphone	1
	Poly-bag, 50 × 90, connector	1
	Poly-bag, 200 × 230, set	1
	Poly-bag, 180 × 250, Inst. booklet	1
	Poly-bag, 80 × 120, spare plug	1
* In EUROPE, order with following part nos.		
R-498851	Individual carton	1
R-418225a	Styrol filler, Left side of set	1
R-418226	Styrol filler, Right side of set	1
R-478582	Instruction booklet	1
R-368145	Vinyl case, power cord	1
	Poly-bag, 350 × 400, set	1
	Poly-bag, 140 × 240, accessories	1
	Poly-bag, 100 × 200, mic.	1
R-498931	Carton filler	1
CABINET		
R-AT31101	Front cabinet assembly	1
R-318285	(Cabinet, plastic body)	(1)
R-278210	Stud nut	4
R-278230	Stud nut	1
R-268280	Reflector, cassette bed	1
R-268837	Overlay, ALC	1
R-268703	Sash	1
R-268859	Trade mark badge	1
R-398175	Mic. holder	1
R-268848	Overlay, controls	1
R-318310a	Button, EJECT	1
R-119446	Button holder	1
R-44229	Cushion	1
R-398169	Latch lever, cassette case	1
R-119565	Holder, latch lever	1
R-119445a	Lever, cassette eject	1
R-158342b	Pressure spring, latch lever	1
R-158332	Tension spring, cassette case	1
R-158350	Tension spring, cassette case	1
R-158344	Special screw, back cabinet	3
R-S88692	Handle	1
R-248477	Handle holder	2
	Polyethylene washer 8.2×12×0.5mm	2
	Polyethylene washer 8.2×12×1.5mm	2
R-118562a	Speaker fixer	2
R-S88654	Knob, Volume and Tone	2
	Felt washer 10×18×1mm, Knob	2
R-AT32202	Cassette case	1
R-318287	(Case, plastic body)	(1)
R-398168	Clear window	1
R-258102a	Plate spring	2
R-268702	Overlay	1
R-AT31102	Back cabinet	1
R-318286	(Plastic body)	(1)

Parts No.	Description	Q'ty
CABINET		
R-478522	Battery index sheet	1
R-458020	Ribbon	1
R-268849	Name plate (R-268879 in Europe)	1
R-478670	Label, voltage change (in Europe)	1
R-258136	Battery terminal (sawteeth edge)	1
R-258137	Battery terminal (flat edge)	1
R-S3063	Lug	3
	Fiber washer 3.3×8×0.5mm	3
R-398203	Label, Voltage note (in Europe)	1
	Sponge cushion 60×125×2mm	1
	Vinyl wire 0.18/6, 150/5/5, (B)	1
	Fiber washer 3×10×1mm	1
R-318291	Battery comp. lid	1
R-398185	Cover, voltage select plug	1
	Fiber washer 3×6×0.5mm	1
R-AT32204	Printed circuit board w/components	1
R-268732a	Bracket, p. c. b.	1
R-25257b	Tip, thermistor fixing	1
R-368114	Jack plate (R-368161 in Europe)	1
	Fiber washer 2.5×8×1.5mm	1
R-119626	Bracket, AC power recepracle	1
R-119448	Bracket, p. c. b.	1
R-119492a	Bracket, meter	1
R-368143	Sheet cover, AC power recep.	1
R-158231	Tension spring, R/P switch returning	1
R-418029	Cushion, meter	1
R-148433	Screw w/spring washer, chassis mtg.	4
R-428157	Shield sheet, p. c. b.	1
R-428162	Shield sheet, p. c. b.	1
	Fiber sheet 15×15×0.5mm fuse holder	1
	Rubber cushion 10×12×8mm, P. T.	2
R-119627	Bracket, voltage select socket	1
R-119756	Bracket, Fuse mtg. (in Europe)	1
R-398206	Label, Ground (in Europe)	1
R-398241	Label, Fuse rating (in Europe)	1

Ref. No.	Parts No.	Description	Q'ty
ELECTRICAL PARTS			
P.T.	R-W7909	Power transformer (R-W7913 in Europe)	1
I.P.T.	R-W6859	Input transformer	1
O.P.T.	R-W6858	Output transformer	1
	R-W8819	Oscillator coil	1
	R-W1842	Choke coil	1
	R-S5812	Meter	1
	R-S6953	Speaker	1
VR1,2	R-R116810	Variable resistor, 10KΩ VR & Tone	2
VR3	R-R11015	Semi-fixed VR, 500KΩ Bias curr. adj.	1
	R-261193a	Heat sink, power transistors	1
S1	R-S4877	Slide switch, Record/Play change	1
S2	R-S4822	Slide switch, Monitor on/off	1
S5	R-S4266	Slide switch, AC/DC change (ISO)	1
	R-S2859	Socket, MIC. AUX. SP.	3
	R-S2839a	Socket, Remote	1
Tr-1		Transistor 2SB303	1
Tr-2		Transistor 2SB186	1
Tr-3		Transistor 2SB187	1
Tr-4,5		Transistor 2SB405	2
Tr-6		Transistor 2SB185	1
		Thermistor SDT-06, Temp. comp.	1
		Diode 1S188, ALC	1
		Rectifier 10DC or 1S1849R, Power	1
		Rectifier 10DC or 1S1849 or DS-17	1
	R-S6963	Microphone	1
	R-S6953	Speaker	1
	R-S88682	Audition cassette tape	1
	R-S6063	Lug	1
	R-S3046	Terminal strip 5P	1
	R-S1260a	Fuse 0.5A	1
	R-S1886	Fuse holder (R-S1893 in Europe)	1
	R-S1227	Pin plug, voltage select	1
	R-S2133a	Socket, voltage select	1
	R-S3069L	Terminal strip, 3P (in Europe)	1
	R-S1892	Fuse 0.5A, (in Europe)	2
	R-S1883	Fuse 2A, (in Europe)	2

As the AC power cord depends upon the destination, your order must contain its destination mark (A, B, C or D) stamped on a individual carton of the recorder.

'S LIST

Ref. No.	Parts No.	Description	Q'ty
ELECTRICAL PARTS			
* "A" marked recorder, order with following Part Nos.			
	R-S88711	Power cord w/plug (England type)	1
	R-S3823b	Power receptacle terminal (on the recorder)	1
	R-S1245	Spare 3-Pin plug (Australia type)	1
* "B" marked recorder, order with following Part Nos.			
	R-S88690	Power cord w/plug (SEV type)	1
	R-S3824	Power receptacle terminal (on the recorder)	1
* "C" marked recorder, order with following Part Nos.			
	R-S88712	Power cord w/plug (Photex type)	1
	R-S3823b	Power receptacle terminal (on the recorder)	1
	R-S1076a	Spare 3-Pin plug (England type)	1
* "D" marked recorder, order with following Part Nos.			
	R-S3856	Power cord w/plug (SEW type)	1
	R-S3824	Power receptacle terminal (on the recorder)	1
	R-S8574b	Power adaptor, 2-Pin/Siemens type	1
	R-S8575b	Power adaptor, 2-Pin/England type	1
* In Europe, order with following Part Nos.			
	R-S3857	Power cord w/plug	1
	R-S1884	Spare plug	1
	R-S3824b	Power receptacle terminal (on the recorder)	1
CAPACITORS			
C1		Ceramic 0.0047μF ±20% 50WV	1
C2	R-C9871	Electrolytic 100μF 6.3WV	1
C3	R-C9867	Electrolytic 4.7μF 16WV	1
C4	R-C9865	Electrolytic 33μF 6.3WV	1
C5		Mylar, 0.047μF ±20% 50WV	1
C6	R-C9867	Electrolytic 4.7μF 16WV	1
C7	R-C9869	Electrolytic 0.22μF 10WV	1
C8	R-C9867	Electrolytic 4.7μF 16WV	1
C9	R-C9865	Electrolytic 33μF 6.3WV	1
C10	R-C9867	Electrolytic 4.7μF 16WV	1
C11	R-C9871	Electrolytic 100μF 6.3WV	1
C12	R-C9897	Electrolytic 470μF 6.3WV	1
C13,14		Ceramic 0.0047μF ±20% 50WV	2
C15	R-C9900	Electrolytic 470μF 10WV	1
C16	R-C9854	Electrolytic 1000μF 10WV	1
C18		Ceramic 0.0015μF ±20% 50WV (Changed in Europe)	1
C19	R-C9864	Electrolytic 220μF 6.3WV	1
C20		Ceramic 680pF ±20% 50WV	1
C21		Ceramic 0.001μF ±20% 50WV	1
C22		Mylar 680pF ±20% 10WV	1
C23		Mylar 0.047μF ±20% 50WV	1
C18		Ceramic, 0.001μF ±20% 50WV (in Europe)	1

Parts No.	Description	Q'ty
RESISTORS		
R2	Carbon P-type 270KΩ ±10% 1/4W	1
R3	〃 470Ω 〃 〃	1
R4	〃 82KΩ 〃 〃	1
R5	〃 33KΩ 〃 〃	1
R6	〃 5.6KΩ 〃 〃	1
R7	〃 3.3KΩ 〃 〃	1
R8	〃 47Ω 〃 〃	1
R9	〃 56KΩ 〃 〃	1
R10	〃 8.2KΩ 〃 〃	1
R11	〃 5.6KΩ 〃 〃	1
R12	〃 1.2KΩ 〃 〃	1
R13	〃 270Ω 〃 〃	1
R14	〃 4.7KΩ 〃 〃	1
R15	〃 330Ω 〃 〃	1
R16	〃 10KΩ 〃 〃	1
R17	〃 6.8KΩ 〃 〃	1
R18	〃 220Ω 〃 〃	1
R19	〃 3.9Ω 〃 〃	1
R20	〃 56Ω 〃 〃	1
R21	〃 820Ω 〃 〃 (1KΩ in Europe)	1

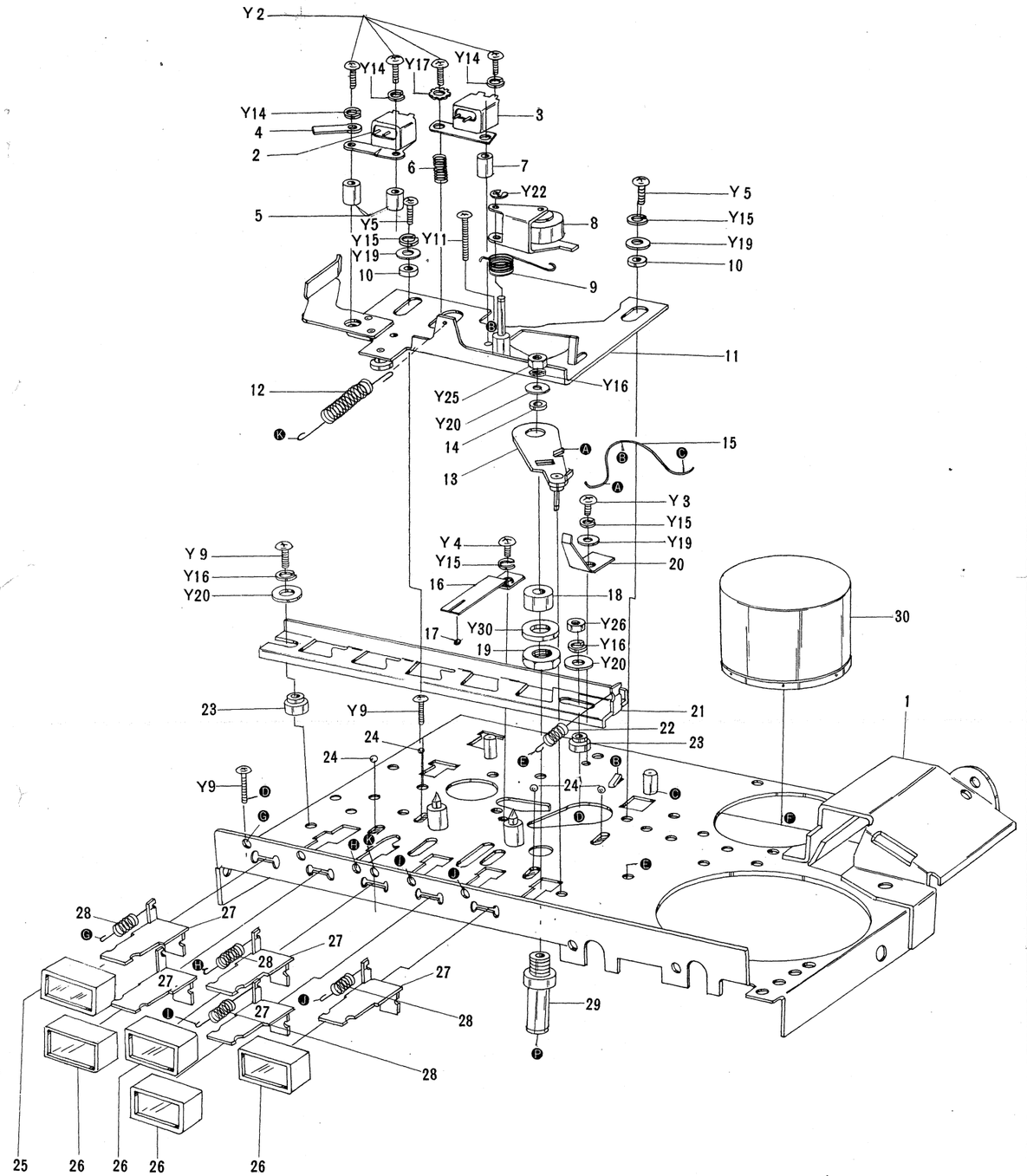
Parts No.	Description	Q'ty
RESISTORS		
R22	Carbon P-type 68Ω ±10% 1/4W	1
R23	〃 470Ω 〃 〃	1
R24	〃 220Ω 〃 〃	1
R25	〃 15Ω 〃 〃	1
R26	〃 1Ω 〃 1/2W	1
R27	〃 56Ω 〃 1/4W	1
R28	〃 22Ω 〃 〃	1
R29	〃 18Ω 〃 〃	1
R30	〃 6.8KΩ 〃 〃	1
R31	〃 68KΩ 〃 〃 (82KΩ in Europe)	1
R32	〃 15KΩ 〃 〃	1
R33	〃 15Ω 〃 〃	1
R34	Carbon L-type 33Ω 〃 1W	1
R35	Carbon P-type 620Ω 〃 1/4W	1

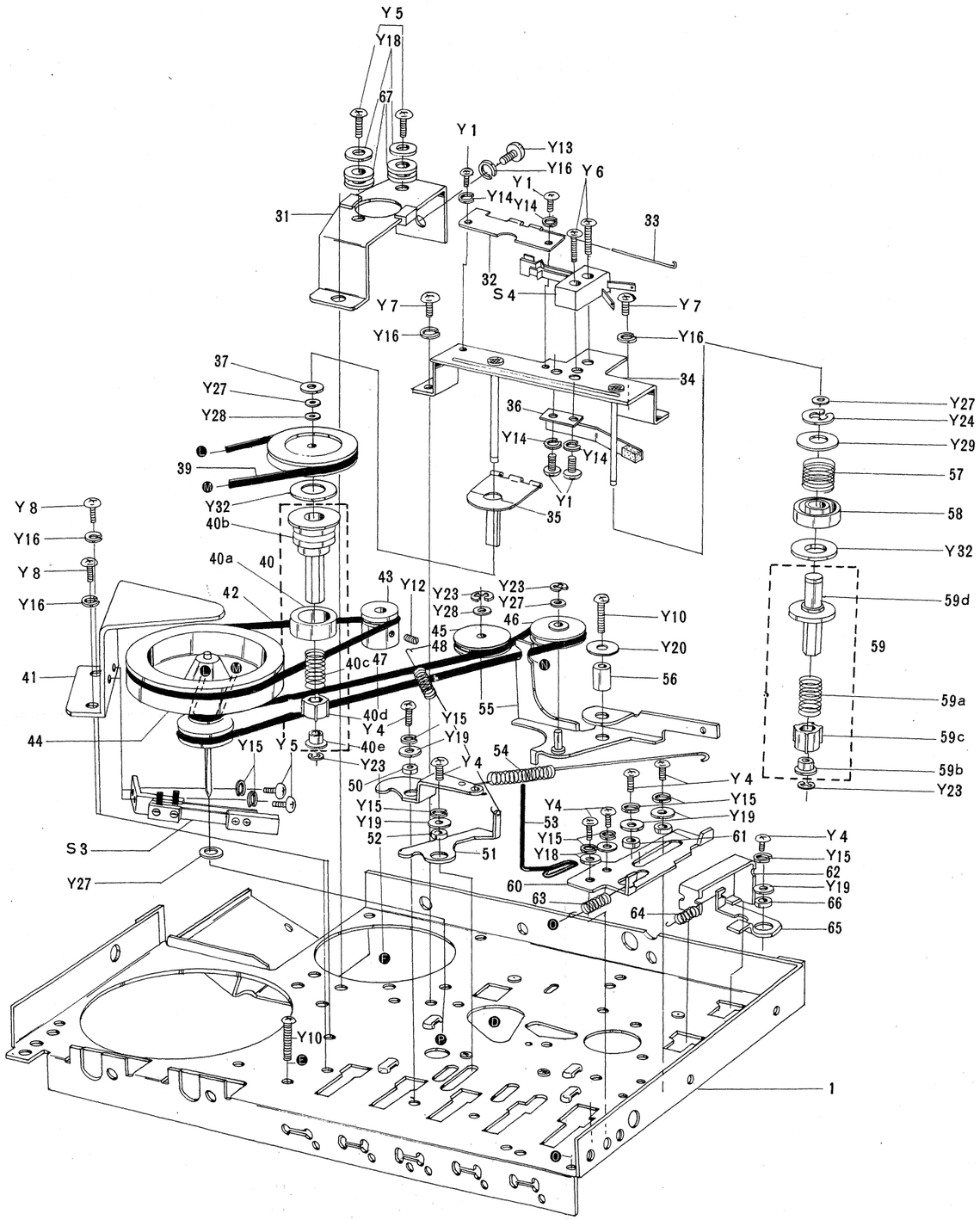
PARTS LIST

Ref. No.	Parts No.	Description	Q'ty
MECHANICAL PARTS			
1	R-S88622	Mechanism chassis assembly	1
2	R-S6883	Erase head	1
3	R-S6939a	Record/Playback head	1
4	R-128229	Lead clamp	1
5	R-248231	Pedestal, erase head	2
6	R-158154	Pressure spring, R/P head adj.	1
7	R-248395a	Pedestal, R/P head	1
8	R-S88634	Pressure lever w/roller assy.	1
9	R-158155a	Torsion spring, pressure lever	1
10	R-248419	Spacer, play slide sifting	2
11	R-S88619b	Play slide assy.	1
12	R-158314	Tension spring, play slide	1
13	R-S88620	Fast forward lever assy.	1
14	R-24670	Spacer, F. Forward lever	1
15	R-128118	Spring pin, fast forward lever	1
16	R-128218	Play slide holder	1
17	R-Y552000	Steel ball, play slide	1
18	R-238020	Oil cap, capstan	1
19	R-248243	Nut, flywheel bearing	1
20	R-128219a	Cassette holder	1
21	R-119567	Slide, push button lock	1
22	R-158316	Tension spring, lock slide (21)	1
23	R-248416	Spacer, lock slide (21)	2
24	R-Y553175	Steel ball, play slide	4
25	R-AM16301	Record button assembly	1
26	R-AM11302	Play, Rewind, F. Forward and Stop button assembly	4
27	R-119099	Push button interlock	5
28	R-158317	Tension spring, push button	4
29	R-S88286a	Flywheel bearing	1
30	R-S5199a	Motor	1
31	R-11901a	Bracket, motor	1
32	R-238027	Hinge plate, winding clutch	1
33	R-128099a	Hinge shaft, winding clutch	1
34	R-S88294	Bracket, reel spindles	1
35	R-258053	Plate lever, winding clutch	1
36	R-AM16303	Lever back tension	1
37	R-258051	Washer, winding clutch	1
38	R-398078	Pulley, take-up	1
39	R-448059	Belt, take-up drive	1
40	R-S88284	Take-up reel spindle assy.	1
40a	R-448058	Rubber tire	1
40b	R-398075	Reel spindle	1
40c	R-128083	Pressure spring	1
40d	R-328038	Reel driver	1
40e	R-328087a	Spindle cap	1
41	R-S88623	Bracket, flywheel pivot	1
42	R-448142	Belt, flywheel drive	1
43	R-278103	Motor pulley	1
44	R-S88281	Flywheel assy.	1
45	R-398077	Fast forward pulley	1
46	R-398076	Rewind pulley	1
47	R-448060a	Belt, rewind and forward	1
48	R-158320a	Tension spring, rewind	1
49	R-119098a	Lever, fast forward	1
50	R-248420	Spacer, F. Forward lever	1
51	R-119084	Lever, rewind	1
52	R-248420	Spacer, rewind lever	1
53	R-158315	Pin, R/P switch act.	1
54	R-158319b	Tension spring, fast forward	1
55	R-S88621	See-saw lever, rewind pulley mtg.	1
56	R-248418	Pipe, see-saw lever mtg.	1
57	R-158152a	Pressure spring, supply spindle	1
58	R-398079	Spring cap	1
59	R-S88295	Supply reel spindle assy.	1
59a	R-398080	Reel spindle	1
59b	R-128083	Pressure spring	1
59c	R-328038	Reel driver	1
59d	R-328087a	Spindle cap	1
60	R-119403	Slide, record act.	1
61	R-248420	Spacer, record slide	2
62	R-119812	Slider, miss-record detect	1
63	R-158321	Tension spring, record slide	1
64	R-158318	Tension spring, slide (62)	1
65	R-119096	Lever, miss-record protection	1
66	R-248420	Spacer, lever (65)	1

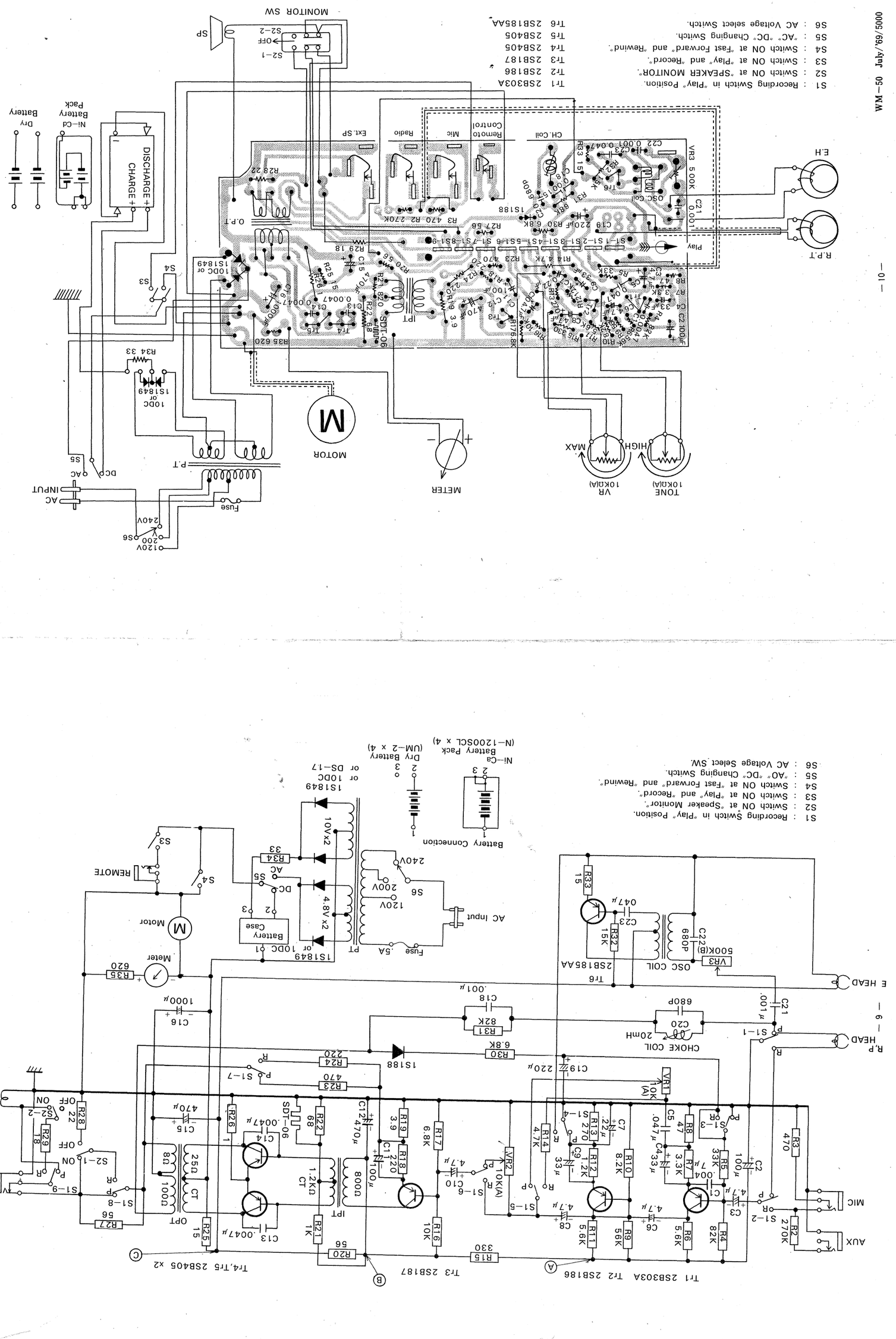
Ref. No.	Parts No.	Description	Q'ty
MECHANICAL PARTS			
67	R-448089	Rubber bushing, motor mtg.	2
S3	R-S4919a	Spring switch, REMOTE act.	1
S4	R-S4939	Spring switch, F. Forward and rewind	1
	R-448155	Rubber cushion, push buttons	1
	R-448056	Rubber cushion, motor bracket	2
	R-S3063	Lug	2
	R-158287	Tension spring, used with (54)	1
	R-128242	Washer, supply and take-up spindles	2

EXPLODED VIEW





CIRCUIT DIAGRAM



WIRING DIAGRAM

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